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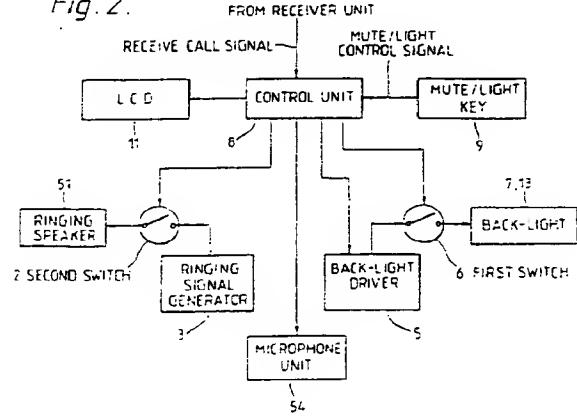
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④ Telephone having receive call indicating function and mute/light key.

⑤ A telephone having a receive call indicating function and a mute/light key includes means for displaying at least the arrival of a call, means for illuminating the display, means for driving the illuminating means, means for manually providing a key signal, control means for intermittently providing a first control signal in response to the arrival of a call, for providing a second control signal when the control means receives the key signal during a conversation, and for providing a third control signal when the control means receives the key signal during a stand-by state, switch means connected between the driving means and the illuminating means for selectively connecting the driving means to the illuminating means in response to the first to third control signals, and a microphone unit which is disabled in response to the second control signal.

Fig. 2.



## Description

### TELEPHONE HAVING RECEIVE CALL INDICATING FUNCTION AND MUTE/LIGHT KEY

#### BACKGROUND OF THE INVENTION

The present invention relates to a telephone having a receive call indicating function and a mute/light key and, more particularly, to a hand-held portable (HHP) telephone having such a function and a key.

The HHP telephone of the prior art typically has a keyboard for inputting call signals and so forth and a liquid crystal display (LCD) for indicating the telephone number dialled and so on. For convenient use at night, the HHP telephone further includes a back-light for illuminating the LCD. When called, the HHP telephone alerts the user to the arrival of the call (or receive call) by turning on and off a message, such as "CALL", on the LCD, illuminated by the back-light, while outputting a ringing signal.

With the conventional HHP telephone referred to above, however, when the ringing signal is less audible in a car, the intermittent lighting of the message "CALL" may have too little impact to alert the user. Therefore, the user would then fail to notice the arrival of the call. It is even more difficult to alert the user at night.

Furthermore, when the user makes a call at night, he or she requires to turn on the back-light for inputting control signals from the keyboard. For this purpose, the HHP telephone comprises a switch for turning on and off the back-light which switch has to be mounted on the face of the HHP telephone. The available space on the HHP telephone casing, however, is limited because the HHP telephone has a built-in keyboard, needs a part by which the user can hold it and has to be compact in size.

#### SUMMARY OF THE INVENTION

An object of the present invention, therefore, is to provide a telephone embodying the saving of space by making the back-light switch thereof serve as a mute key as well.

Another object of the invention is to provide a telephone capable of alerting the user to the arrival of any call with greater certainty.

According to the present invention, there is provided a telephone having a receive call indicating function and a mute/light key comprising display means for displaying at least the arrival of a call, illuminating means for illuminating the display means, driver means for driving the illuminating means, key means for manually providing a key signal, control means for intermittently providing a first control signal in response to the arrival of a call, for providing a second control signal when the control means receives the key signal during conversation, and for providing a third control signal when the control means receives the key signal during stand-by state, switch means connected between the driver means and the illuminating means for selectively connecting the driver means to the illuminating means in response to the first to third control signals, and microphone unit means

being disabled in response to the second control signal.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in further detail below with reference to the accompanying drawings, in which:

FIG. 1 shows a perspective view of a hand-held portable telephone having a receive call indicating function and a mute/light key, which is a preferred embodiment of the invention;

FIG. 2 is a block diagram of the preferred embodiment of the invention; and

FIG. 3 is a flowchart showing the operation of a control section illustrated in FIG. 2.

#### DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a keyboard 10 for inputting a call signal and so forth is provided on the front central part of an HHP telephone 100. On the front lower part are arranged grills 1 and 4 for a ringing speaker or loudspeaker and a microphone unit, which will be described later. An LCD 11 is arranged above the keyboard 10, and further above is a slit 12 for an earpiece receiver, which will also be described later. The LCD 11 is so designed as to be able to display various items including the arrival of a call and a telephone number dialled. A mute/light key 9 is arranged on the upper right side of the HHP telephone 100 so that it can be readily manipulated when the HHP telephone 100 is held by the user.

Behind the keyboard 10 are provided back-lights 7 and 13, indicated by dotted lines in the illustration. When the back-lights 7 and 13 are on, the LCD 11 and the keyboard 10 are illuminated from behind.

FIG. 2 is a block diagram showing the main sections of the telephone shown in FIG. 1. As shown in FIG. 2, the HHP telephone 100 includes a control unit 8 for controlling a first switch 6 and a second switch 2 according to a receive call signal supplied from a receiver unit (not shown). This control unit 8 also controls the turning on and off of a microphone unit 54 and the first switch 6 in response to a mute/light control signal from a mute/light key 9. Furthermore, the control unit 8 controls a back-light driver 5. The first switch 6 connects and disconnects a back-light driver 5 and back-lights 7 and 13 in response to the receive call signal. The second switch 2 connects and disconnects a ringing speaker 51 and a ringing signal generator according to the receive call signal. The control unit 8 also controls an LCD 11 on which "CALL" is displayed in response to the arrival of the call.

Now will be described the operation of the telephone of Fig. 2 with reference to FIG. 2 and the flowchart of FIG. 3. This flowchart basically shows the following procedure. When the mute/light key 9 is closed, either the back-lights 7 and 13 will be turned on during the stand-by condition of the telephone, or the microphone unit 54 will be muted

and the back-lights turned on during telephone conversation. If a call arrives, the ringing and the intermittent turning on and off of the back-lights will continue until the user takes the telephone off the hook, that is, the line is connected.

The flowchart will now be explained in further detail. First, power supply to the telephone is started at Step 21, followed by Step 22 where it is checked whether or not the mute/light key 9 is pressed down. If it is, the back-light-driver 5 is actuated, and the first switch 6 closed to turn on the back-lights 7 and 13 (Steps 23 and 24), followed by a move ahead to Step 25. Even if the mute/light key 9 is not pressed down at Step 22, the sequence also moves on to Step 25.

At Step 25, the arrival of a call is monitored and, if no arrival is detected, the sequence returns to Step 22. If a receive call is detected, the receive call message "CALL" is displayed on LCD 11 at Step 33. Then the second switch 2 is turned on to output the ringing signal at Step 26 which is followed by Step 27, where the off-hook state is monitored. If the off-hook state is not detected, the sequence proceeds to Step 31 to turn off the first and second switches 6 and 2. The loop of Steps 24, 25, 33, 26, 27 and 31 means that the ringing and the intermittent turning on and off of the back-lights continues at a suitable interval, while display "CALL" on LCD 11, until the user takes the telephone off the hook at Step 27.

If the off-hook state is detected at Step 27, the display "CALL" is erased from LCD 11 and the first and second switches 6 and 2 is opened to turn off the backlights 7 and 13 and discontinue the ringing (Step 28), followed by Step 29. If the mute/light key 9 is found to be pressed down at Step 29, the sequence proceeds to Steps 30 and 32. Thus, the pressing down of the key 9 mutes the microphone unit 54 and turns on the back-lights 7 and 13 again. If the key 9 is not found pressed down at Step 29, the state at this step is retained at it is, i.e. the mute/light key 9 is kept off.

The mute key of an HHP telephone of the prior art is intended only for muting the microphone during conversation. In other words, it is never used in a stand-by state. Since the telephone according to the present invention has a mute key with an additional function to turn on the back-lights, the key can be useful in a stand-by state as well.

Muting during conversation means non-use of the microphone and, consequently, moving the handset away from the ear. Since the back-lights are on at this time, the keys will be visible even in the dark.

Further, flashing the back-lights during displaying the receive call message "CALL" on the LCD can give the user a greater impact, which could be even greater at night. At the same time, the intermittent illumination from behind also facilitates the user's operation of the telephone.

Although the preferred embodiment described above is an HHP, the invention can as well be applied to a handset of a car telephone or the like.

To sum up, the present invention can provide a telephone in which space saving is achieved by combining the back-light switch and the mute key and which can notify the user of the arrival of a call

with greater certainty.

## 5 Claims

1. A telephone having a receive call indicating function and a mute/light key comprising:  
display means for displaying at least the arrival of a call;  
illuminating means for illuminating said display means;  
driver means for driving said illuminating means;  
key means for manually providing a key signal;  
control means for intermittently providing a first control signal in response to the arrival of a call, for providing a second control signal when said control means receives said key signal during conversation, and for providing a third control signal when said control means receives said key signal during stand-by state;  
switch means connected between said driver means and said illuminating means for selectively connecting said driver means to said illuminating means in response to said first to third control signals; and  
microphone unit means being disabled in response to said second control signal.
2. A telephone as claimed in Claim 1, wherein said key means is comprised by a press-type mute/light key, and wherein said control means comprises:  
first means for judging whether or not said mute/light key is pressed down;  
second means for turning on said driver means when said first means judges said mute/light key to be pressed down;  
third means for turning on said switch means when said first means judges said mute/light key to be pressed down and said second means turns on said driver means;  
fourth means for detecting the presence of the arrival of a call when said mute/light key is pressed down, said second means turns on said driver means and said third means turns on said switch means;  
fifth means for judging whether or not said telephone is off the hook if said fourth means detects said receive call signal; and  
sixth means for muting said microphone unit means and turning on said switch means again when said fifth means detects the off-hook state and said third means does not turn on said switch means.
3. A telephone as claimed in Claim 1, wherein said displaying means is comprised of a liquid crystal display (LCD).
4. A telephone as claimed in Claim 2, wherein said illuminating means is comprised of a back-light for illuminating said LCD from behind.
5. A method of controlling the turning on and off of a back-light of a telephone and muting a

microphone of the same comprising the step  
of;

(i) judging whether or not a key is  
pressed down, immediately followed by a  
second step (ii) if said key is judged to be  
pressed or by a fourth step (iv) if it is not;

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(ii) turning on a light driver means after  
the completion of said first step (i);

(iii) closing a switch after the completion  
of said second step (ii);

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(iv) detecting the presence of a receive  
call signal after the completion of said third  
step (iii), followed by a fifth step (v) if the  
presence is detected or by a return to said  
first step (i) if the presence is not detected;

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(v) judging whether or not said tele-  
phone is off the hook after the completion  
of said fourth step (iv), followed by a sixth  
step (vi) if said telephone is judged to be  
off the hook or by a return to said third step  
(iii) after opening said switch if it is not  
judged so;

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(vi) opening said switch after the com-  
pletion of said fifth step (v);

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(vii) judging whether or not said key is  
pressed down after the completion of said  
sixth step (vi), followed by an eighth step  
(viii) if it is judged to be pressed down or by  
retention of this state of judgment if it is  
not; and

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(viii) muting said microphone and clos-  
ing said switch at the same time after the  
completion of said seventh step (vii).

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Fig. 1.

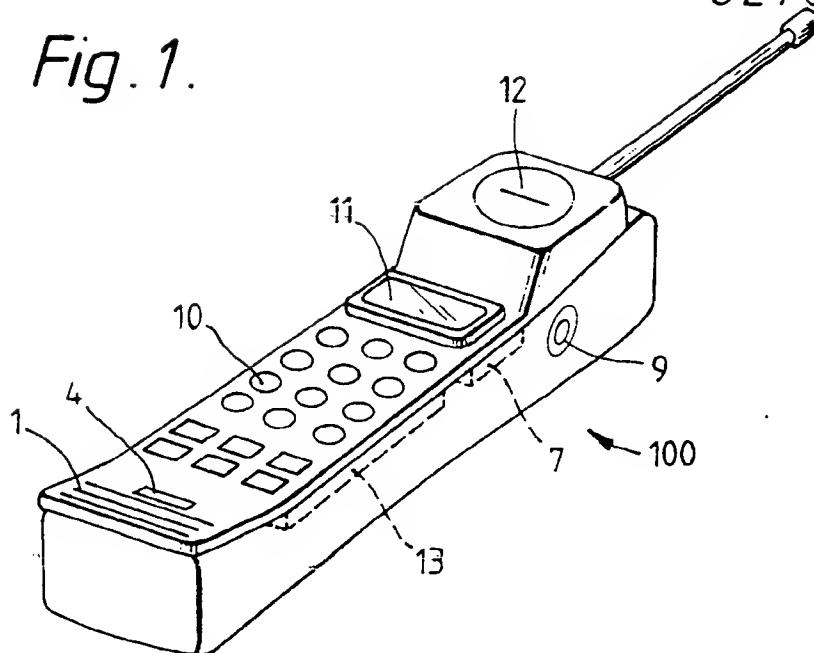


Fig. 2.

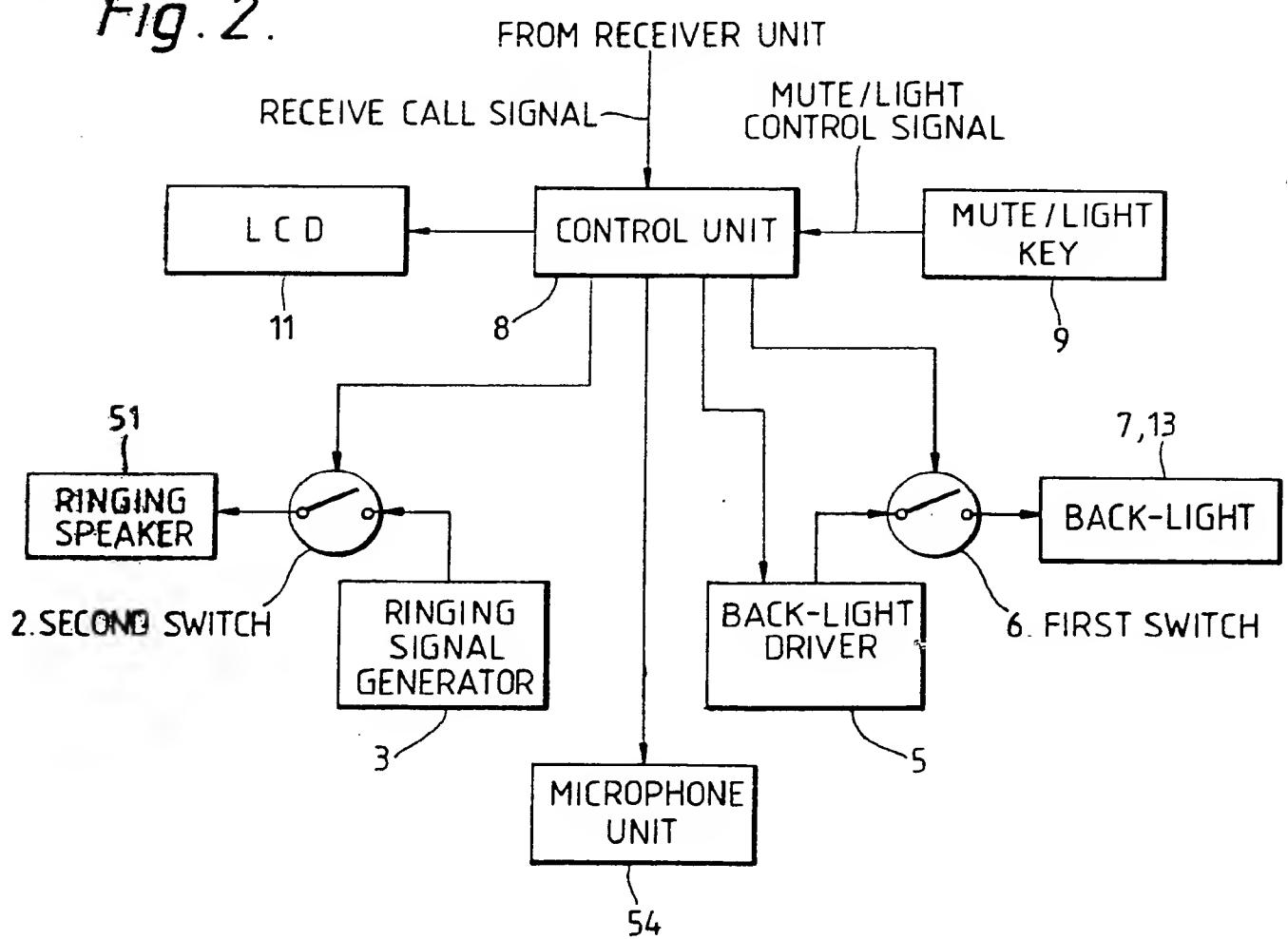
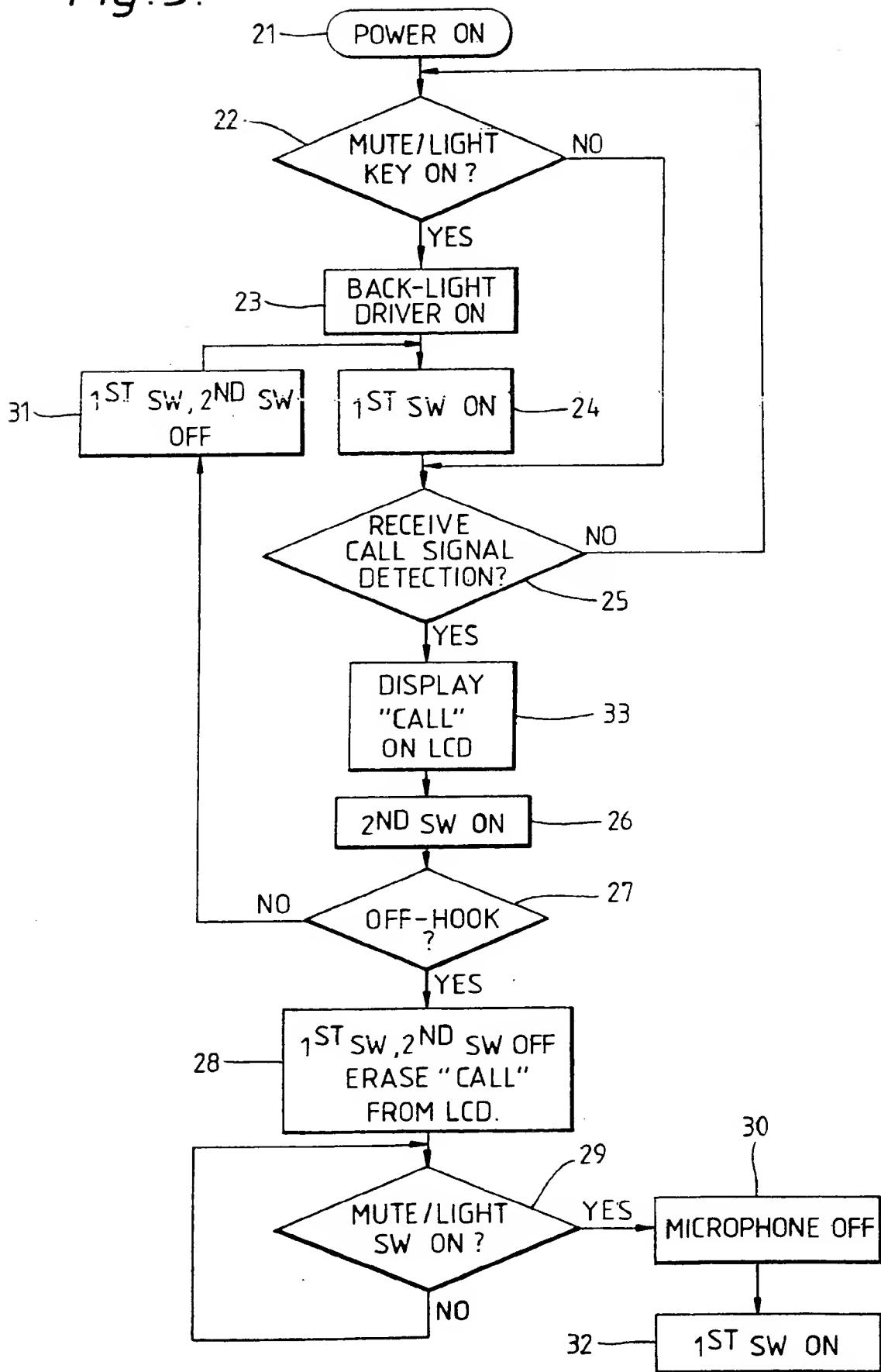


Fig. 3.





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㉛ Telephone having receive call indicating function and mute/light key.

㉜ A telephone having a receive call indicating function and a mute/light key (9) includes means (11) for displaying at least the arrival of a call, means (7, 13) for illuminating the display, means (5) for driving the illuminating means, means (6) for manually providing a key signal, control means (8) for intermittently providing a first control signal in response to the arrival of a call, for providing a second control signal when the control means receives the key signal during a conversation, and for providing a third control signal when the control means receives the key signal during a stand-by state, switch means connected between the driving means and the illuminating means for selectively connecting the driving means to the illuminating means in response to the first to third control signals, and a microphone unit (54) which is disabled in response to the second control signal.

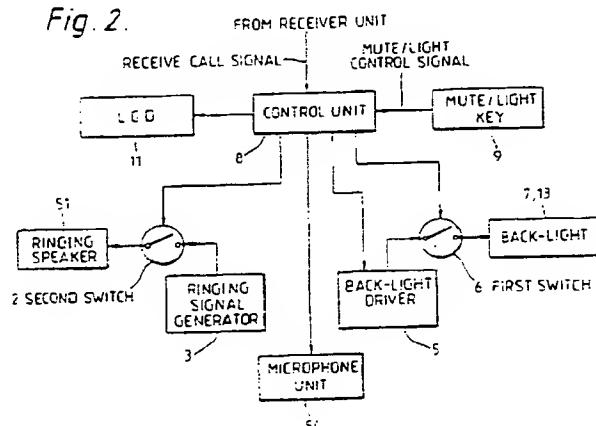
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Fig. 2.





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# EUROPEAN SEARCH REPORT

Application Number

EP 88 30 0254

## DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	PATENT ABSTRACTS OF JAPAN, vol. 9, no. 197 (E-335)[1920], 14th August 1985; & JP-A-60 62 745 (NIPPON DENKI K.K.) 10-04-1985 * Abstract * ---	1, 3-5	H 04 M 1/22 H 04 M 1/00
A	FUJITSU SCI. TECH. J., vol. 22, no. 4, September 1986, pages 318-330, Fujitsu Ltd, Kawasaki, JP; I. FUDEMOTO et al.: "Communication terminals" * Page 323, right-hand column, line 13 - page 324, right-hand column, line 21; figures 7,8 *	1	
A	TELCOM REPORT 9, Sonderheft "NACHRICHTENÜBERTRAGUNG AUF FUNKWEGEN", 1986, pages 319-325, Siemens, Munich, DE; G. KOCH et al.: "Technische und konstruktive Gesichtspunkte bei der Gestaltung von Mobilstationen" * Page 320, right-hand column, line 5 - page 322, left-hand column, line 7; figures 3-5 *	1	
A	PATENT ABSTRACTS OF JAPAN, vol. 10, no. 179 (E-414)[2235], 24th June 1986; & JP-A-61 28 235 (NEC CORP.) 07-02-1986 * Abstract *	1	
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## TECHNICAL FIELDS SEARCHED (Int. Cl.4)

H 04 M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	07-08-1990	DELANGUE P.C.J.G.
<b>CATEGORY OF CITED DOCUMENTS</b>		
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		